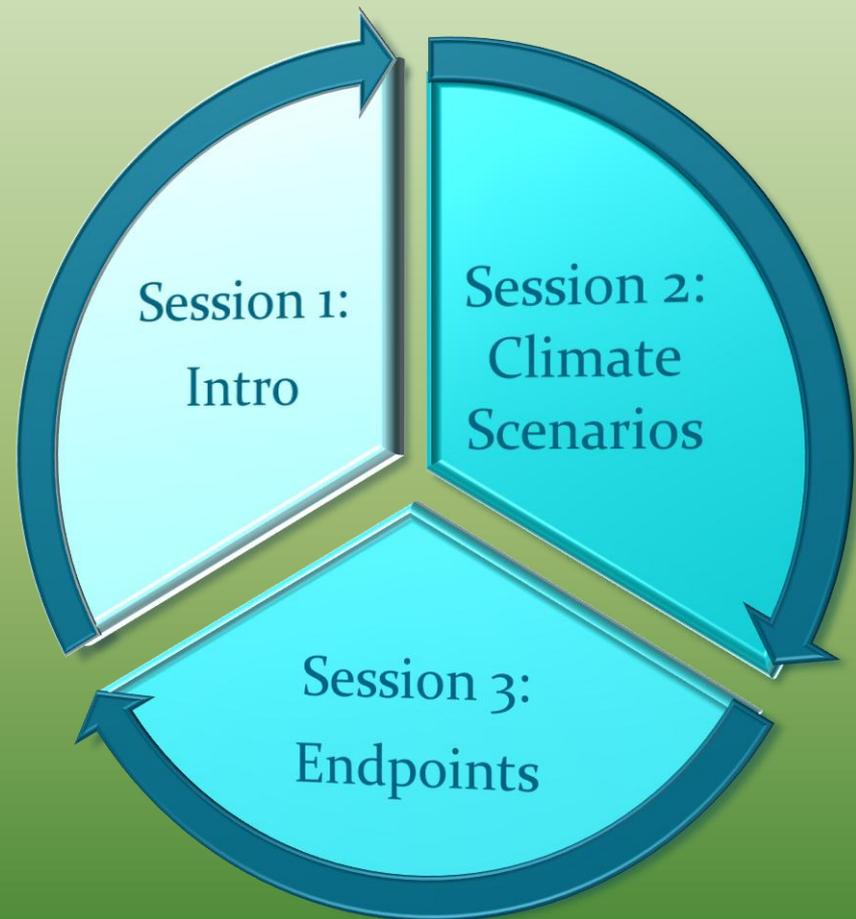




EPA BASINS 4.0

CLIMATE ASSESSMENT TOOL

Environmental Protection Agency's
Global Change Research Program
National Center for Environmental Assessment
Office of Research and Development
EPA/600/R-08/088F | May 2009 | www.epa.gov/ncea2



Session 1: Introduction

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Part A

- Risks of Climate Change from a Watershed Perspective

Part B

- Watershed Managers' Needs and Actions

Part C

- Overview of CAT

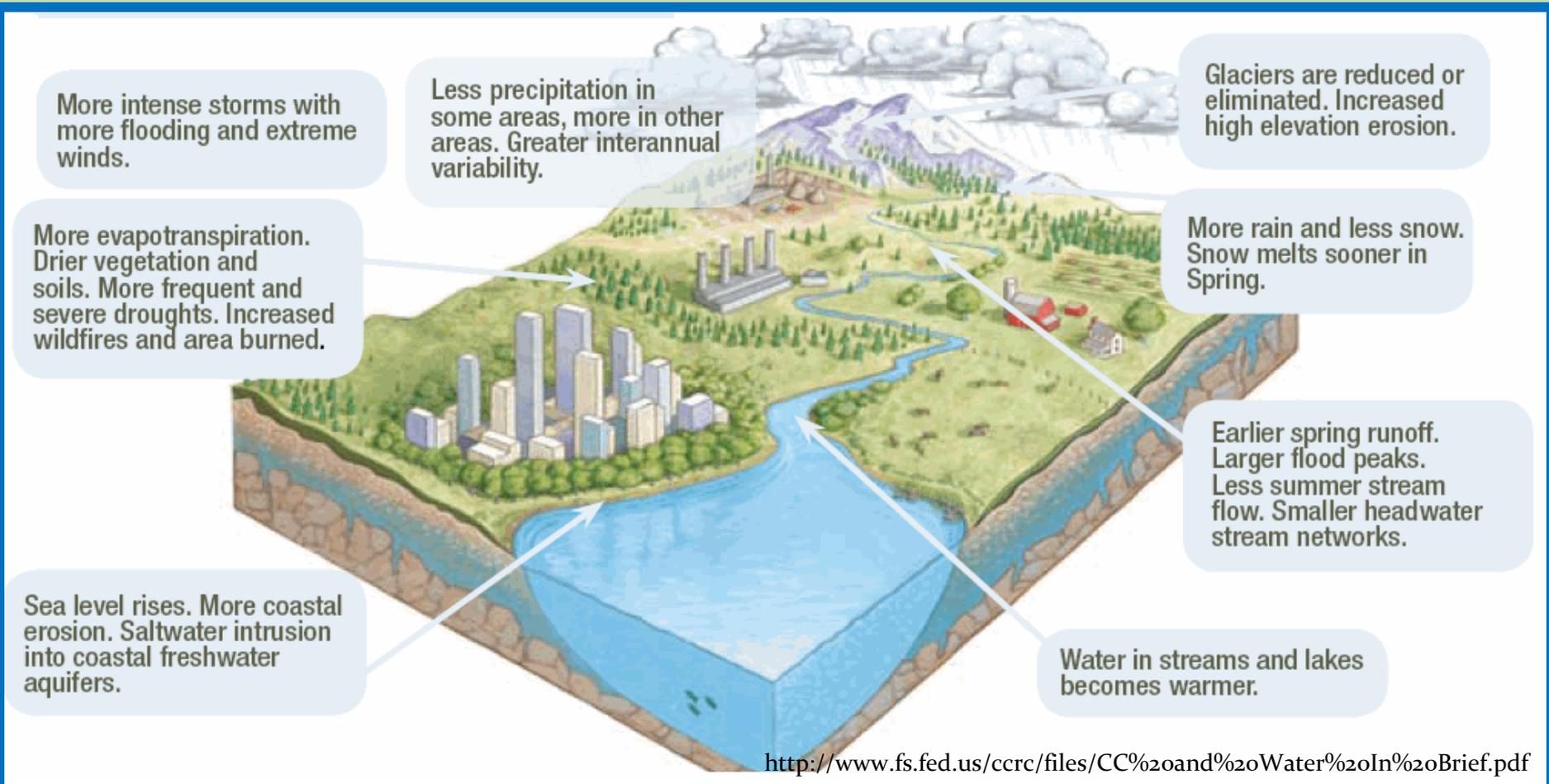
Part D

- Scoping Questions



Session 1: Part A

Risks of Climate Change from a Watershed Perspective



Water and watersheds are highly climate sensitive.

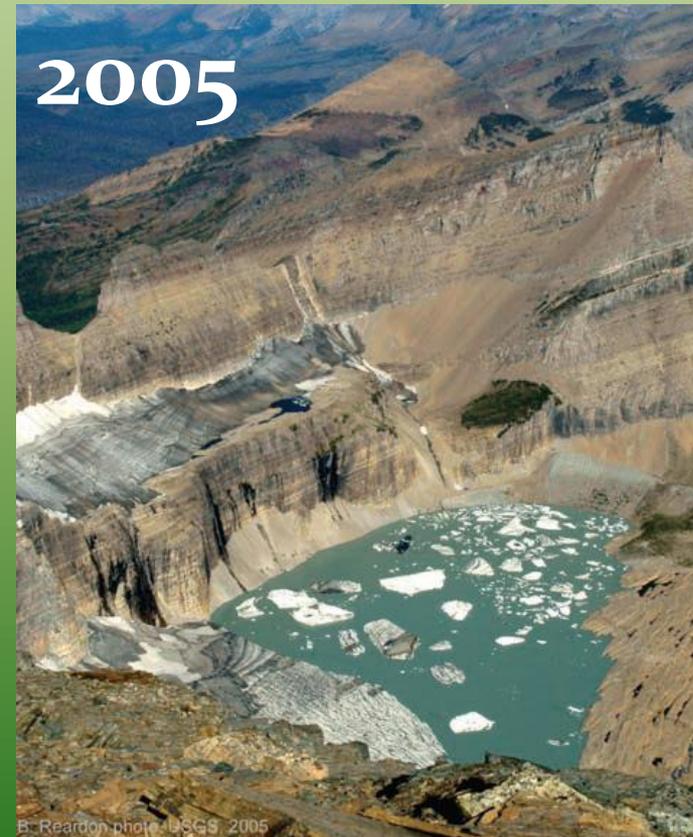
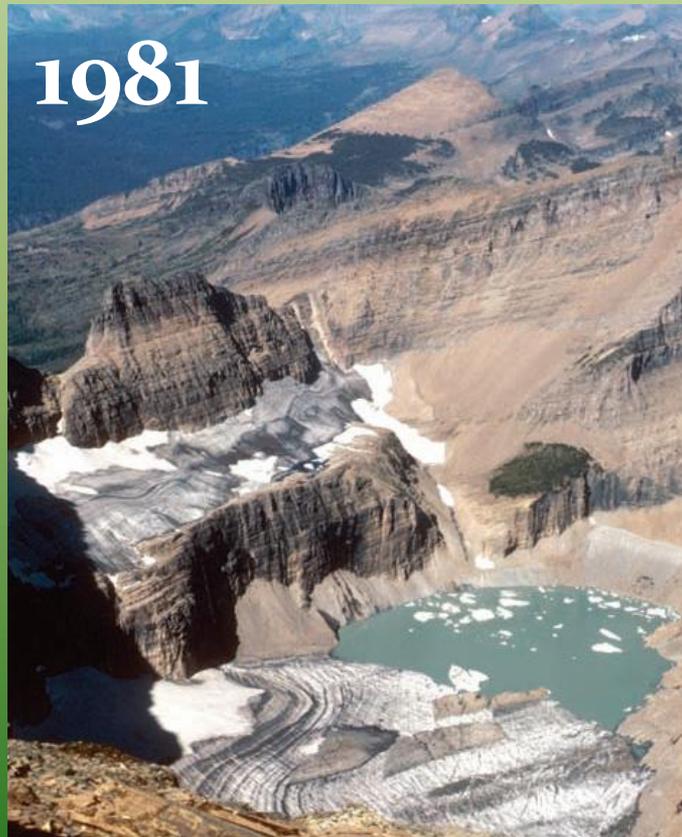
Water Supply



Increased Wildfires



Glaciers Reduced



B. Reardon photo, USGS, 2005

Reduced Water Quality



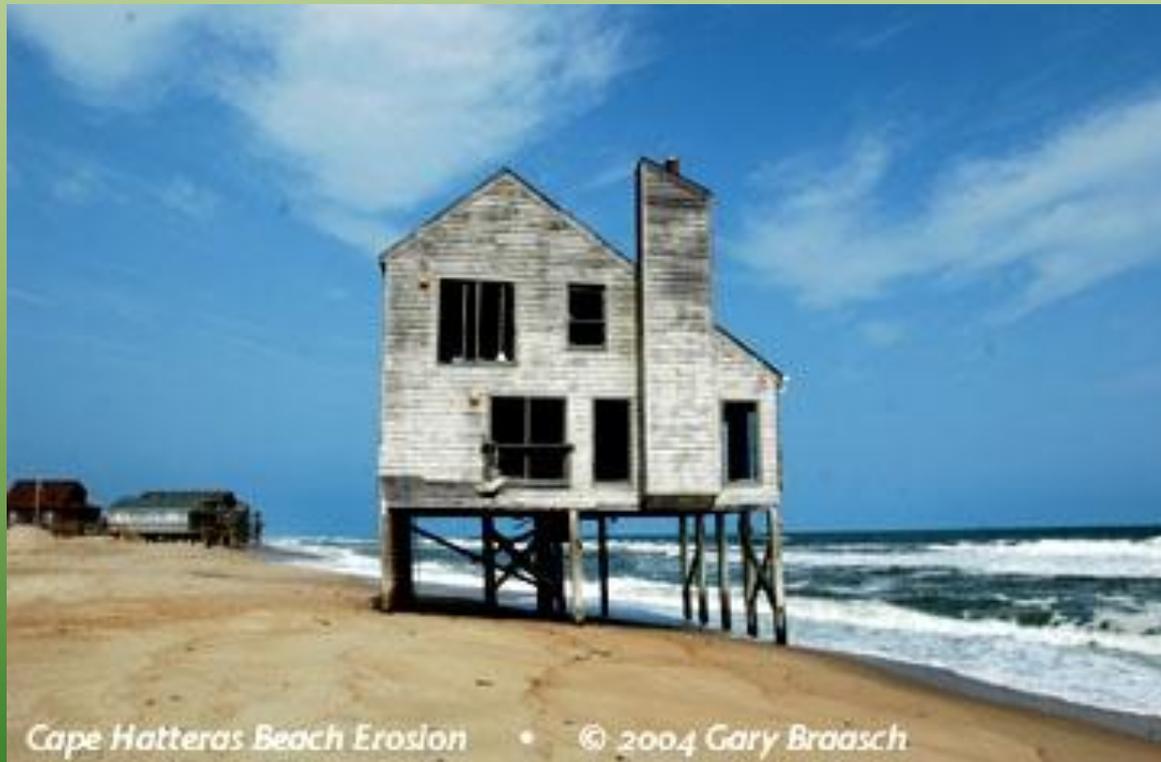
Flooding



Drought



Sea Level Rise





Session 1: Part B

Water Managers' Needs and Actions

Needs of the Watershed Manager

- Identify watersheds and resources most vulnerable to climate change
- Construct scenarios for a range of plausible future climatic changes and assess the likely effects of each, and
- Identify management measures effective in mitigating climatic impacts.

Type of Actions

- Protect and restore riparian forests
- Improve or decommission roads
- Restore meadows, wetlands, and flood plains
- Adapt/refine practices for water supply, flood control, and stormwater management
- Maintain and restore environmental flows
- Remove migration barriers and reestablish habitat connectivity
- Strategically reduce wildfire risks



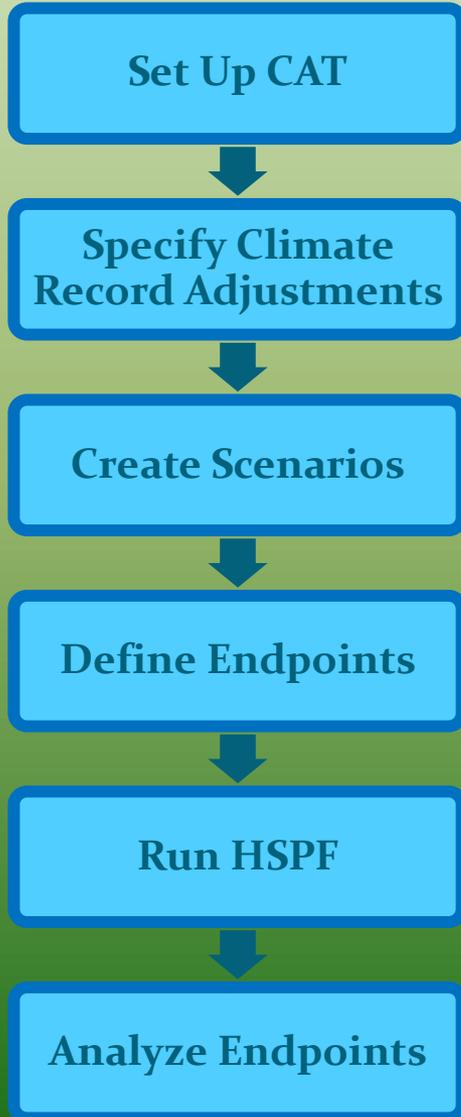
Session 1: Part C

Overview of CAT

Overview of BASINS CAT

- What is CAT
- What CAT is not
- The Delta Method
- CAT Set Up

CAT provides watershed managers a tool to assess climate related risk.



CAT Process Overview

Use of CAT requires an existing, calibrated HSPF model within the BASINS system.

What CAT is NOT

- CAT is NOT a complete or stand alone model
- Does NOT provide climate change scenario data
- Does NOT limit the amount of change relative to precipitation and air temperature

Climate changes well outside the range of variability experienced during the calibration period are NOT appropriate

CAT Applies the Delta Method

- Change scenarios are developed by superimposing a set of changes, or deltas, onto a historical data set
- User defines a base period of historical temperature and precipitation data to reflect any desired future change or changes.

Advantages of the Delta Method

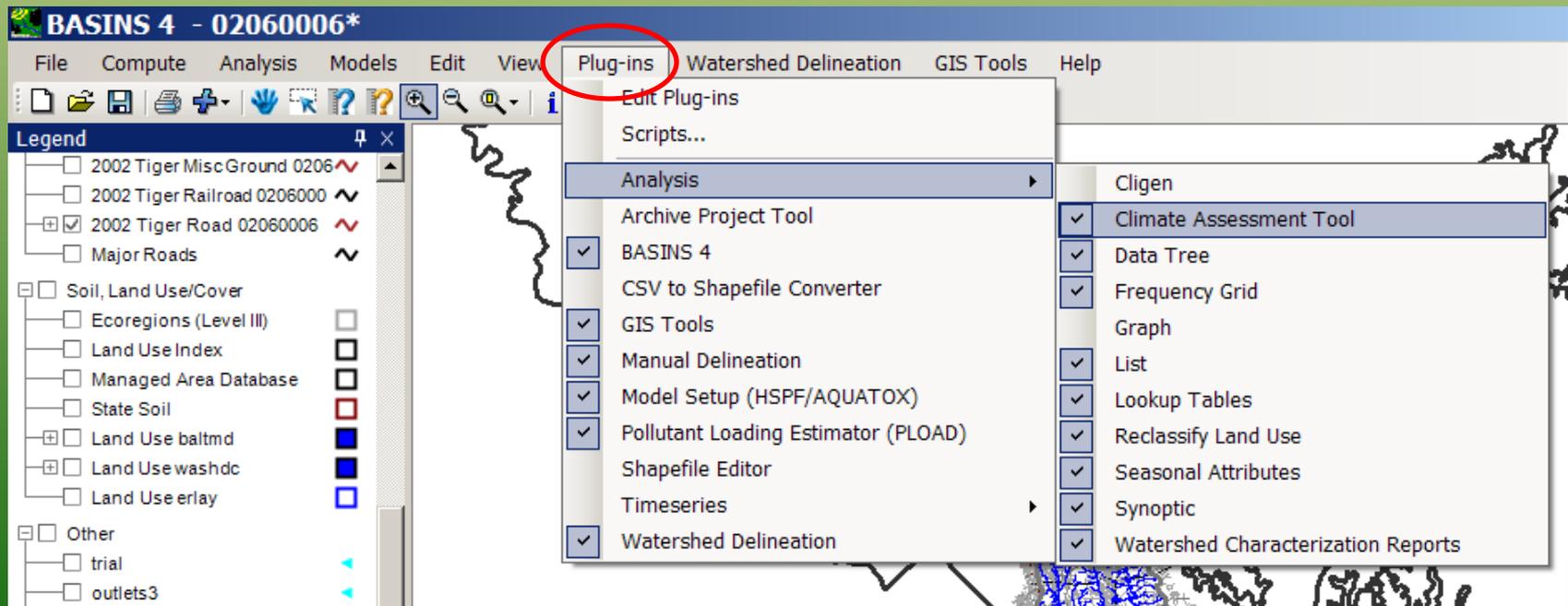
- Relatively simple to implement
- Able to represent a wide range of potential changes
- Change scenarios created will incorporate any spatial or temporal structure present in observed weather records

Limitation of the Delta Method

- Assumes that the model calibration is robust to the proposed changes.
- Users should use their own discretion in interpreting results.
- It **MUST** be assumed that change scenarios do not impact basic watershed behavior in such a way that the model parameterization achieved through calibration is no longer valid.

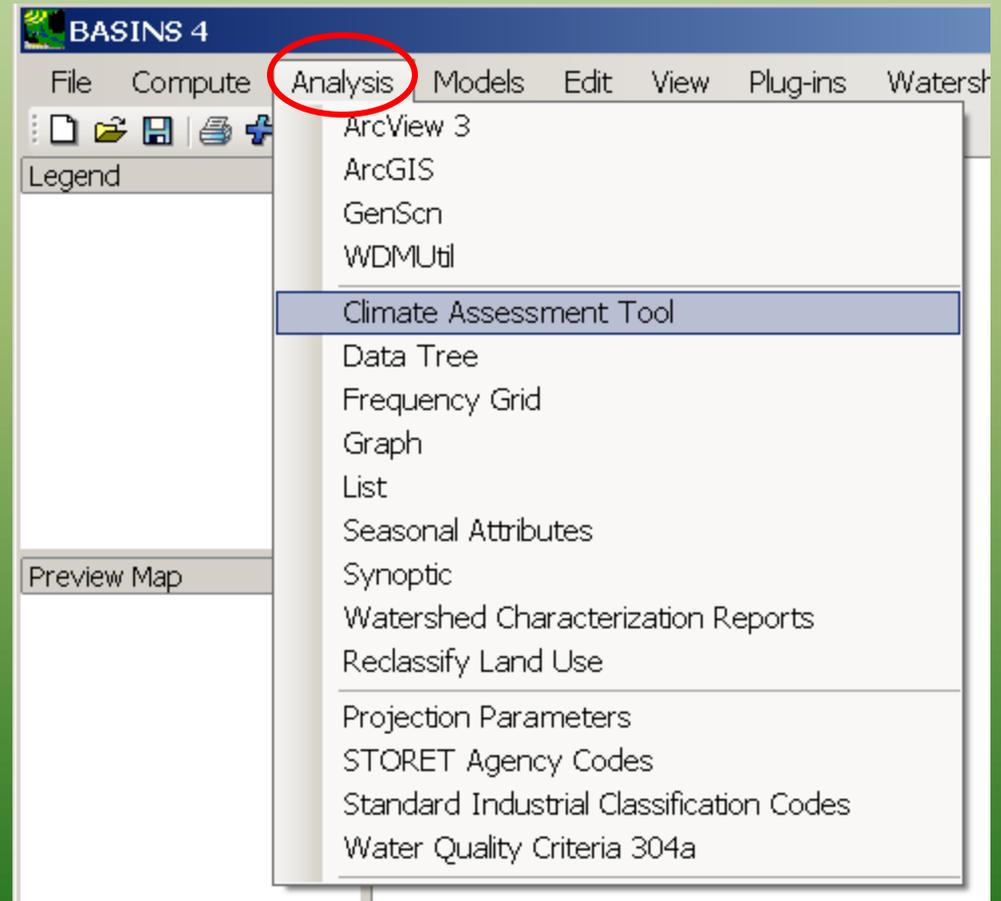
Running CAT

- Requires BASINS Version 4
- From the BASINS main form, activate BASINS CAT by selecting Climate Assessment Tool from the Plug-ins: Analysis menu.

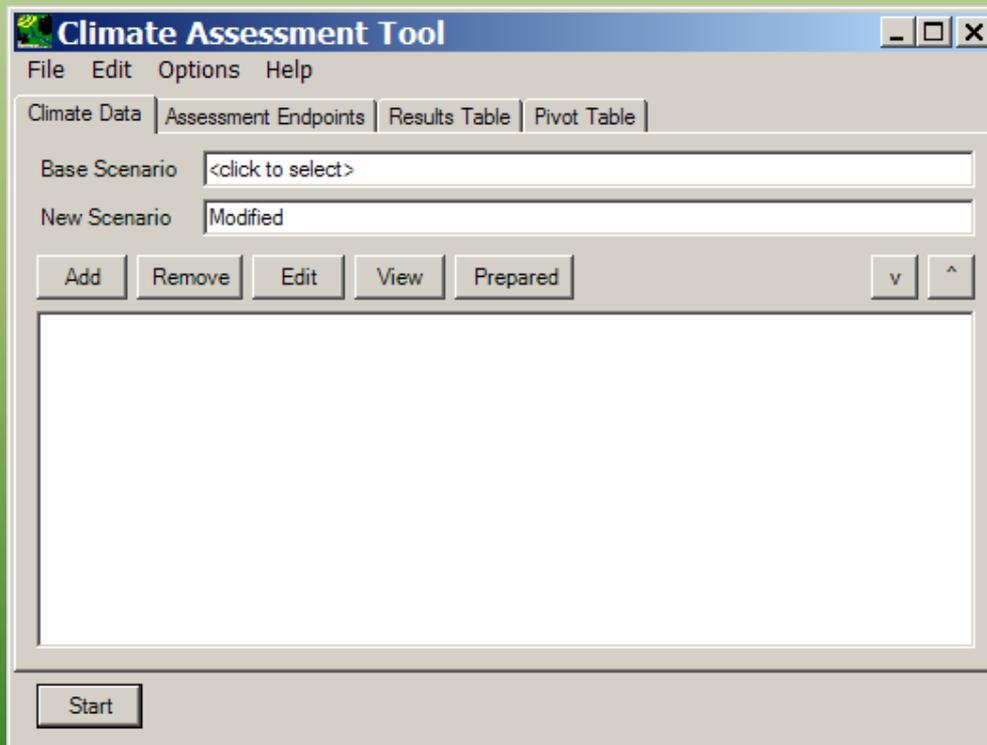


CAT's Main Form

- Click Analysis on BASINS Menu bar.
- The main BASINS CAT form opens. It contains a menu bar, four tabs, and the Start button.



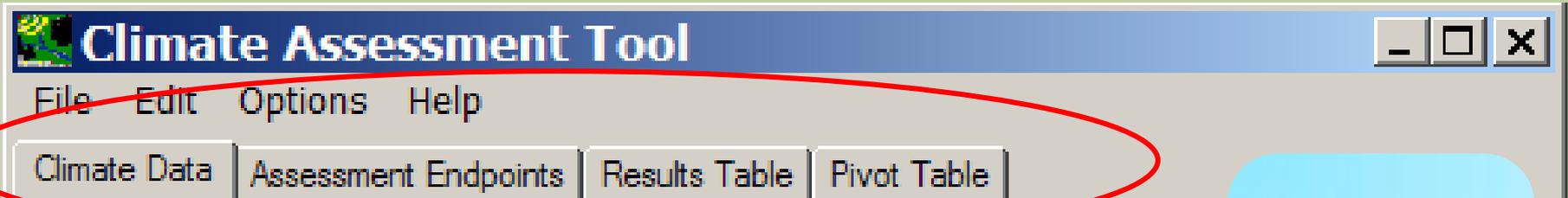
CAT's Main Form



The screenshot shows the 'Climate Assessment Tool' window. It has a menu bar with 'File', 'Edit', 'Options', and 'Help'. Below the menu bar are four tabs: 'Climate Data', 'Assessment Endpoints', 'Results Table', and 'Pivot Table'. The 'Climate Data' tab is active. It contains two text input fields: 'Base Scenario' with the placeholder '<click to select>' and 'New Scenario' with the text 'Modified'. Below these fields are five buttons: 'Add', 'Remove', 'Edit', 'View', and 'Prepared'. To the right of these buttons are two small arrow buttons (down and up). At the bottom left of the window is a 'Start' button.

- File, Edit, Options, Help Menus
- At least one climate scenario and one assessment endpoint are necessary
- After selecting climate data and desired endpoints, press the Start button

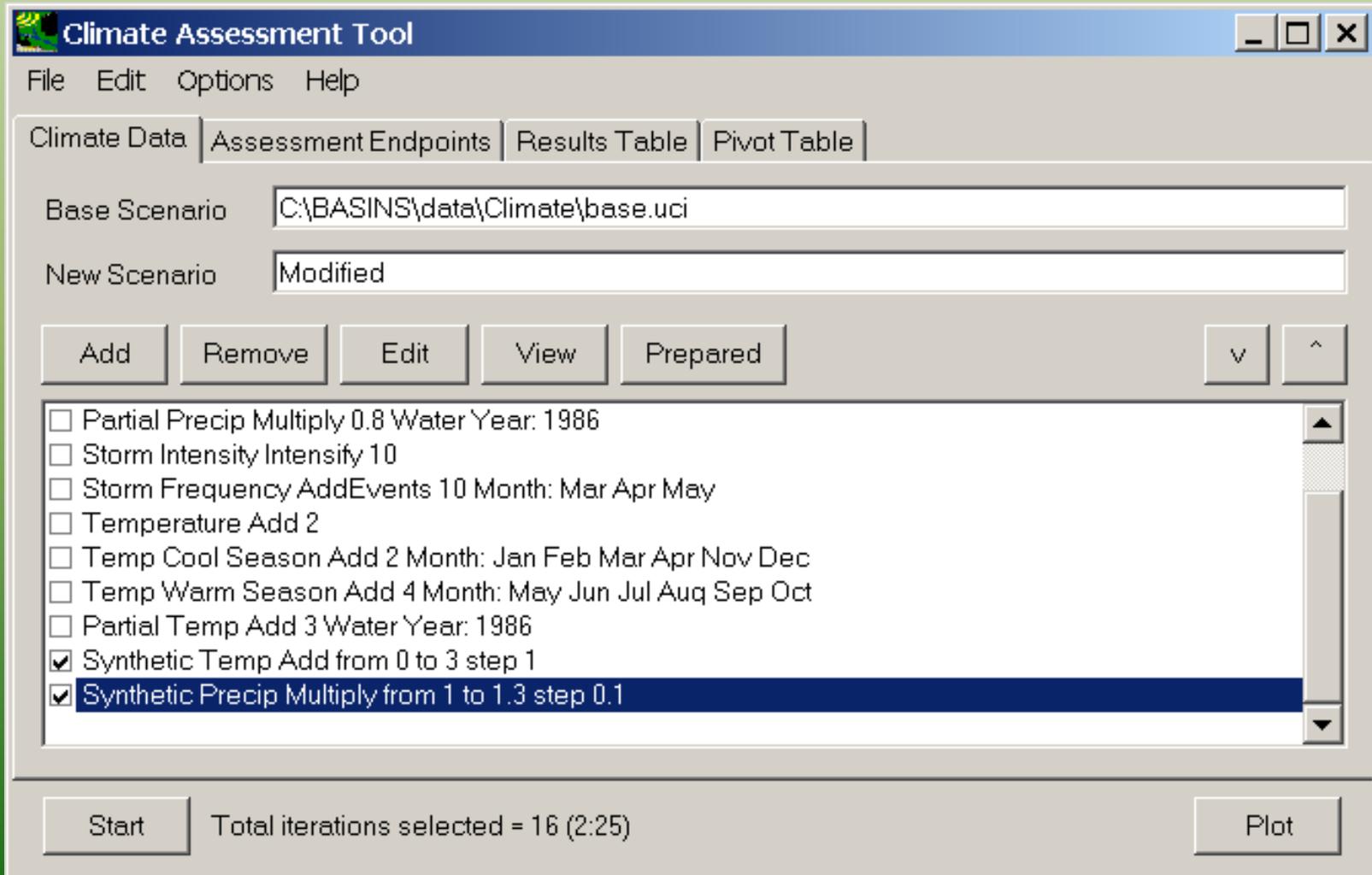
Tabs



- **Climate Data Tab -- to create climate change scenarios**
- **Assessment Endpoint Tab -- to specify endpoints**
- **Result Table and Pivot Table Tabs -- to view model output**

At least one climate scenario and one assessment endpoint are necessary to run CAT.

Climate Data Tab



The screenshot shows the 'Climate Assessment Tool' window. The title bar reads 'Climate Assessment Tool'. The menu bar includes 'File', 'Edit', 'Options', and 'Help'. The 'Climate Data' tab is selected, with other tabs being 'Assessment Endpoints', 'Results Table', and 'Pivot Table'. Below the tabs, there are two text input fields: 'Base Scenario' with the path 'C:\BASINS\data\Climate\base.uci' and 'New Scenario' with the text 'Modified'. A row of buttons includes 'Add', 'Remove', 'Edit', 'View', 'Prepared', and two arrow buttons (down and up). A list box contains several items, each with a checkbox. The last two items are checked and highlighted in blue: 'Synthetic Temp Add from 0 to 3 step 1' and 'Synthetic Precip Multiply from 1 to 1.3 step 0.1'. At the bottom, there is a 'Start' button, a status indicator 'Total iterations selected = 16 (2:25)', and a 'Plot' button.

Climate Assessment Tool

File Edit Options Help

Climate Data | Assessment Endpoints | Results Table | Pivot Table

Base Scenario C:\BASINS\data\Climate\base.uci

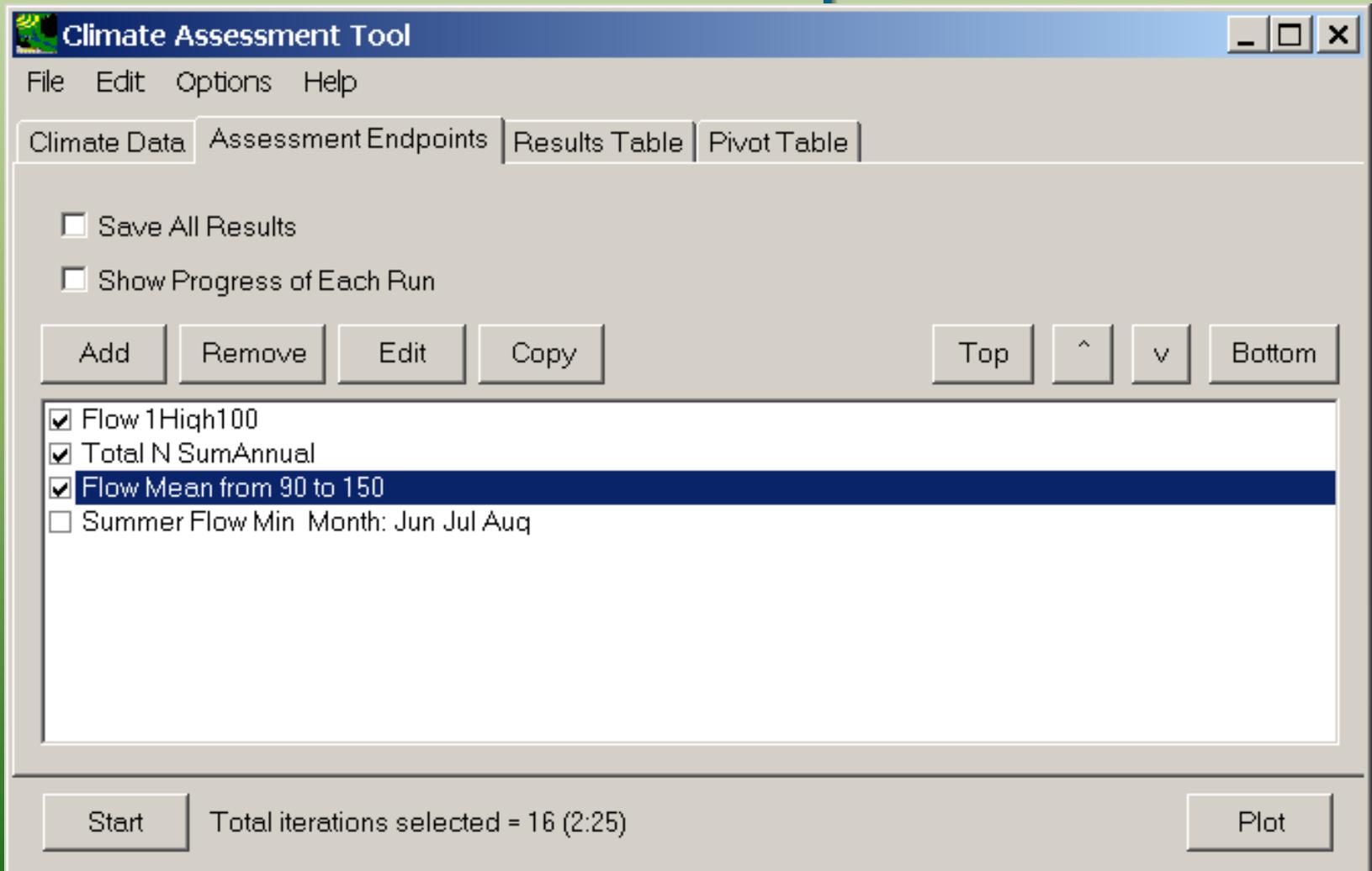
New Scenario Modified

Add Remove Edit View Prepared v ^

- Partial Precip Multiply 0.8 Water Year: 1986
- Storm Intensity Intensify 10
- Storm Frequency AddEvents 10 Month: Mar Apr May
- Temperature Add 2
- Temp Cool Season Add 2 Month: Jan Feb Mar Apr Nov Dec
- Temp Warm Season Add 4 Month: May Jun Jul Aug Sep Oct
- Partial Temp Add 3 Water Year: 1986
- Synthetic Temp Add from 0 to 3 step 1
- Synthetic Precip Multiply from 1 to 1.3 step 0.1

Start Total iterations selected = 16 (2:25) Plot

Assessment Endpoints Tab



The screenshot shows the 'Climate Assessment Tool' application window. The title bar reads 'Climate Assessment Tool' with standard window controls. The menu bar includes 'File', 'Edit', 'Options', and 'Help'. The 'Assessment Endpoints' tab is selected, with other tabs being 'Climate Data', 'Results Table', and 'Pivot Table'. Below the tabs are two unchecked checkboxes: 'Save All Results' and 'Show Progress of Each Run'. A row of buttons includes 'Add', 'Remove', 'Edit', 'Copy', 'Top', '^', 'v', and 'Bottom'. A list box contains four items, each with a checkbox: 'Flow 1High100' (checked), 'Total N SumAnnual' (checked), 'Flow Mean from 90 to 150' (checked and highlighted), and 'Summer Flow Min Month: Jun Jul Aug' (unchecked). At the bottom, there is a 'Start' button, a status indicator 'Total iterations selected = 16 (2:25)', and a 'Plot' button.

Results Table Tab

Climate Assessment Tool [-] [□] [X]

File Edit Options Help

Climate Data | Assessment Endpoints | **Results Table** | Pivot Table

Run	Partial Precip	Partial Temp	Total N	Flow	Summer F
	Multiply	Add	SumAnnual	Mean	Min
	Current Value	Current Value	SCEN RCH5 TN-LOAD	SCEN RCH5 FLOW	SCEN RC
	WaterYear (1986)	WaterYear (1986)			Month (Ju
1	0.8	3	289,260	81.142	10.109

Start Finished runs Plot

Pivot Table Tab

Climate Assessment Tool

File Edit Options Help

Climate Data | Assessment Endpoints | Results Table | **Pivot Table**

Rows: Synthetic Temp Add Current Value

Columns: Synthetic Precip Multiply Current Value

Cells: Flow Mean SCEN RCH5 FLOW

	1	1.1	1.2	1.3
0	95.307	114.23	133.75	153.73
1	92.751	111.44	130.79	150.61
2	90.238	108.69	127.8	147.47
3	87.783	105.98	124.85	144.33

Start Finished runs Plot



Session 1: Part D

Scoping Questions

Scoping Questions

- What are the range of plausible future climatic changes for my watershed(s)?
- What is most vulnerable to climate change in my watershed(s)?
- What hydrologic and water quality endpoints would best represent the impacts on my watershed (s)?
- What mitigation measures seem most appropriate for the impacts likely to occur for each scenario?
- What are my assessment goals?